



# **PUBLIC HEALTH STATEMENT**

## **Heptachlor and Heptachlor Epoxide**

**CAS#: 76-44-8 and 1024-57-3**

**Division of Toxicology and Environmental Medicine**

**September 2005**

This Public Health Statement is the summary chapter from the Toxicological Profile for Heptachlor and Heptachlor Epoxide. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about heptachlor and heptachlor epoxide and the effects of exposure to them.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Heptachlor has been found in at least 206 of the 1,662 current or former NPL sites. Heptachlor epoxide has been found in at least 195 NPL sites. The total number of NPL sites evaluated for these substances is not known. The number of sites at which heptachlor and heptachlor epoxide is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to these substances may harm you.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You

can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to heptachlor or heptachlor epoxide, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with them. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

### **1.1 WHAT ARE HEPTACHLOR AND HEPTACHLOR EPOXIDE?**

Heptachlor is a manufactured chemical that was used in the past for killing insects in homes, in buildings, and on food crops. It has not been used for these purposes since 1988. There are no natural sources of heptachlor or heptachlor epoxide. Trade names for heptachlor include Heptagran, Heptamul, Heptagranox, Heptamak, Basaklor, Drinox, Soleptax, Gold Crest H-60, Termide, and Velsicol 104. Heptachlor is both a breakdown product and a component of the pesticide chlordane (approximately 10% by weight). Pure heptachlor is a white powder. Technical-grade heptachlor is a tan powder and has a lower level of purity than pure heptachlor. Technical-grade heptachlor was the form of heptachlor used most often as a pesticide. Heptachlor smells somewhat like camphor. Heptachlor does not burn easily and does not explode. It does not dissolve easily in water.

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Like pure heptachlor, heptachlor epoxide is a white powder that does not explode easily. It was not manufactured and was not used as an insecticide like heptachlor. Bacteria and animals break down heptachlor to form heptachlor epoxide. This profile describes these two chemicals together because about 20% of heptachlor is changed within hours into heptachlor epoxide in the environment and in your body.

You might find heptachlor or heptachlor epoxide in the soil or air of homes treated for termites, dissolved in surface water or groundwater, or in the air near hazardous waste sites. You might also find heptachlor or its byproduct, heptachlor epoxide, in plants and animals near hazardous waste sites. Heptachlor can no longer be used to kill insects on crops or in homes and buildings. However, heptachlor is still approved by EPA for killing fire ants in power transformers.

### **1.2 WHAT HAPPENS TO HEPTACHLOR AND HEPTACHLOR EPOXIDE WHEN THEY ENTER THE ENVIRONMENT?**

From 1953 to 1974, heptachlor entered the soil and surface water when farmers used it to kill insects in seed grains and on crops. It also entered the air and soil when homeowners and professional insect exterminators used it to kill termites. Today, heptachlor is no longer used by homeowners to kill termites or other insects. However, exterminators can still use existing stocks of heptachlor to kill fire ants in power transformers.

Heptachlor and heptachlor epoxide can enter the air, soil, groundwater, and surface water from leaks at

hazardous waste sites or landfills. Heptachlor sticks to soil very strongly and evaporates slowly into the air. Heptachlor does not dissolve easily in water. Heptachlor epoxide dissolves more easily in water than heptachlor does and evaporates slowly from water. Like heptachlor, heptachlor epoxide sticks to soil.

Both heptachlor and heptachlor epoxide can travel long distances in the wind from places where they are released, such as treated fields or manufacturing sites. In soil and water, heptachlor is changed by bacteria into the more harmful substance, heptachlor epoxide, or into other less harmful substances. Plants can absorb heptachlor through their roots from the soil. Heptachlor in the air can be deposited on plant leaves and enter the plant from contaminated soil.

Animals that eat plants containing heptachlor can also absorb it. Animals can also change heptachlor to heptachlor epoxide in their bodies. Heptachlor epoxide breaks down very slowly in the environment. It can stay in soil and water for many years. Both heptachlor and heptachlor epoxide build up in fish and in cattle. People store heptachlor epoxide in their fatty tissue. Some studies show that heptachlor epoxide can still be measured in fatty tissue 3 years after a person is exposed to it.

Most of the breakdown products of heptachlor are thought to be less harmful than heptachlor itself. However, in laboratory animals, heptachlor epoxide is more harmful than heptachlor.

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### **1.3 HOW MIGHT I BE EXPOSED TO HEPTACHLOR AND HEPTACHLOR EPOXIDE?**

Exposure to heptachlor and heptachlor epoxide most commonly occurs when you eat food contaminated with those chemicals. Contaminated foods might include fish, shellfish (such as clams), dairy products, meat, and poultry. Children and toddlers drink large amounts of milk and may have greater exposure if the milk is contaminated with heptachlor or heptachlor epoxide. Infants can be exposed to these compounds from drinking breastmilk or cow's milk.

Exposure can also occur when you drink water, breathe air, or touch contaminated soil at hazardous waste sites that contain heptachlor or heptachlor epoxide. People whose homes have been treated with heptachlor to kill termites can be exposed by breathing heptachlor in the air. After heptachlor is changed to heptachlor epoxide in the soil, it can get into the air. People who breathe this air will be exposed to heptachlor epoxide. Workers who use heptachlor to kill fire ants are exposed if they breathe in the heptachlor or get it on their skin.

Background levels of a substance are levels found in the environment that cannot be traced to a specific source. Information on background levels of heptachlor and heptachlor epoxide in the air was not found. In one survey, the background levels of heptachlor in drinking water and groundwater in the United States ranged from 20 to 800 parts of heptachlor in one trillion parts of water (ppt). Heptachlor was found in less than 2% of U.S. groundwater samples that are known to be contaminated from pesticide application. The average level

of heptachlor in the contaminated groundwater samples was 800 ppt. No information was found for levels of heptachlor epoxide in groundwater or drinking water. Heptachlor epoxide has been found in surface water (river, lakes) at levels between 0.1 and 10 parts of heptachlor epoxide in one billion parts of water (ppb, 1 ppb is 1 thousand times more than 1 ppt).

Heptachlor and heptachlor epoxide stick to sediment and soil. The sediment in stream beds usually contains much more of the heptachlor that enters the water. Sediment in stream beds is likely to contain a lot of the heptachlor that enters the water. Heptachlor and heptachlor epoxide were found in less than 0.7 and 1.8% of river bed sediments that were tested from 2003 to 2005. Contaminated fish and shellfish have been found to contain 2–750 ppb heptachlor and 0.1–480 ppb heptachlor epoxide. Heptachlor epoxide has been found in human milk samples at levels ranging from 0.13 to 128 ppb. See Chapter 6 for more information on how you might be exposed to heptachlor and heptachlor epoxide.

### **1.4 HOW CAN HEPTACHLOR AND HEPTACHLOR EPOXIDE ENTER AND LEAVE MY BODY?**

When you breathe air containing heptachlor or heptachlor epoxide, both can enter your bloodstream through your lungs. It is not known how fast these compounds enter and remain in the bloodstream. Both heptachlor and heptachlor epoxide can also enter your body through your stomach after you eat food or drink water or milk containing them. Most of the heptachlor that is

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swallowed passes through your stomach into your blood. It can also enter your body through your skin. Heptachlor and heptachlor epoxide can pass directly from a mother's blood to an unborn baby through the placenta. It can also pass from the mother to an infant through breast milk.

Once inside your body, heptachlor is changed to heptachlor epoxide and other related chemicals. Most of the heptachlor, heptachlor epoxide, and other breakdown products leave your body in the feces within a few days after exposure. Some breakdown products can also leave in the urine. Some heptachlor and heptachlor epoxide are stored in your body fat for long periods after exposure has occurred. The heptachlor and heptachlor epoxide that have been stored in fat leave your body much more slowly.

### **1.5 HOW CAN HEPTACHLOR AND HEPTACHLOR EPOXIDE AFFECT MY HEALTH?**

Scientists use many tests to protect the public from harmful effects of toxic chemicals and to find ways for treating persons who have been harmed.

One way to learn whether a chemical will harm people is to determine how the body absorbs, uses, and releases the chemical. For some chemicals, animal testing may be necessary. Animal testing may also help identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method for getting information needed to make wise decisions that protect public health. Scientists have the responsibility to treat research animals with care

and compassion. Scientists must comply with strict animal care guidelines because laws today protect the welfare of research animals.

People can begin to smell heptachlor or heptachlor epoxide at around 0.3 milligrams in a cubic meter of air (0.3 mg/m<sup>3</sup>). No reliable studies in humans were found that show whether harmful health effects occur as a result of breathing heptachlor or heptachlor epoxide. No animal studies examining the harmful effects resulting from breathing air that contains heptachlor or heptachlor epoxide were found.

In addition, no reliable human studies were found that show whether harmful effects occur from eating contaminated foods or by drinking liquids contaminated with heptachlor or heptachlor epoxide. Studies have shown a number of harmful health effects when animals were fed heptachlor or heptachlor epoxide. These effects were more harmful when the exposure levels were high or when exposure lasted many weeks. The effects observed in animals include damage to the liver, excitability, and decreases in fertility. Animal studies have also shown that heptachlor and heptachlor epoxide can affect how the brain functions in animals exposed during gestation and infancy. We do not know whether these effects also occur in people exposed to heptachlor or heptachlor epoxide in the same way.

Animals fed heptachlor throughout their lifetime had more liver tumors than animals that ate food without heptachlor. EPA and the International Agency for Research on Cancer have classified heptachlor as a possible human carcinogen. EPA also considers heptachlor epoxide as a possible human carcinogen.

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Chapter 3 contains more information on the adverse health effects of heptachlor and heptachlor epoxide.

### **1.6 HOW CAN HEPTACHLOR AND HEPTACHLOR EPOXIDE AFFECT CHILDREN?**

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Some studies in animals suggest that young animals exposed during gestation and infancy may be very sensitive to heptachlor and heptachlor epoxide. Changes in nervous system and immune function were found in these animals. There is some evidence that similar effects may occur in humans, but a study that found some changes in performance on some tests that measure nervous system function is not conclusive and exposure to other chemicals cannot be ruled out. Exposure to higher doses of heptachlor in animals can also result in decreases in body weight and death in animal newborn babies.

### **1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO HEPTACHLOR AND HEPTACHLOR EPOXIDE?**

If your doctor finds that you have been exposed to substantial amounts of heptachlor and heptachlor epoxide, ask whether your children might also have been exposed. Your doctor may need to ask your state health department to investigate significant exposures.

Heptachlor is no longer used in the United States except to control fire ants; therefore, exposure should be limited. Before the use of heptachlor was cancelled in 1988, it was used on various agricultural crops, in homes for the treatment of termites, and in power lines for fire ant control. However, because of the persistence of both heptachlor and heptachlor epoxide, exposure to the general population can occur from contaminated water, soil, and air. People who live in homes where heptachlor was used for termite control or on farms where heptachlor was used on crops may have a higher risk of exposure through contaminated crops, soil, water, and air. To avoid exposure from contaminated soil, you should discourage your children from eating or playing with dirt near home or barn foundations. Make sure they wash their hands frequently and before eating. Discourage children from putting their hands in their mouths or other hand-to-mouth activities.

Heptachlor and heptachlor epoxide are also persistent in food and milk. Eating fish from contaminated water can increase exposure to heptachlor. Do not fish or eat fish from contaminated water. Local fishing advisories can tell you if the water is contaminated.

### **1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO HEPTACHLOR AND HEPTACHLOR EPOXIDE?**

Laboratory tests can detect heptachlor and heptachlor epoxide in blood, fat, breast milk, and body tissues after exposure to high levels of those

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chemicals. These tests are not commonly available at your doctor's office. Most often, the test for heptachlor epoxide is used because heptachlor is quickly changed into heptachlor epoxide in your body. Blood samples are used most often because they are easy to collect. These tests are specific for heptachlor and heptachlor epoxide. However, heptachlor is both a breakdown product and a component of chlordane, another pesticide. So if heptachlor and heptachlor epoxide are measured in the blood, the actual exposure could have been to chlordane. Methods for measuring heptachlor and heptachlor epoxide in body fat are more precise and can detect lower levels than tests that measure levels in blood. If heptachlor or heptachlor epoxide is found in your blood or fat, it is not possible to tell when you were exposed to these chemicals or if harmful health effects will occur.

### 1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations *can* be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but *cannot* be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as “not-to-exceed” levels, that is, levels of a toxic substance in air, water, soil, or food that do not exceed a critical value that is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for heptachlor and heptachlor epoxide include the following:

For exposures of up to 10 days, EPA recommends that a child weighing 22 pounds or less not drink water containing levels of heptachlor or heptachlor epoxide more than 0.01 mg heptachlor or heptachlor epoxide per liter of water (0.01 mg/L or 0.01 ppm). EPA requires that drinking water should not contain more than 0.0004 mg/L (0.004 ppm) heptachlor and 0.0002 mg/L (0.0002 ppm) of heptachlor epoxide.

FDA controls the amount of heptachlor and heptachlor epoxide on raw food crops and on edible seafood. The limit on food crops is from 0.01 to 0.05 parts heptachlor per million parts food (0.01–0.05 ppm) depending on the type of food product. The limit on edible seafood is 0.3 ppm.

OSHA recommends that the highest average amount of heptachlor in workplace air over an 8-hour workday for a 40-hour workweek not be more than 0.5 mg/m<sup>3</sup>.

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### **1.10 WHERE CAN I GET MORE INFORMATION?**

If you have any more questions or concerns, please contact your community or state health or environmental quality department, your regional Nuclear Regulatory Commission office, or contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

Toxicological profiles are also available on-line at [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov) and on CD-ROM. You may request a copy of the ATSDR ToxProfiles CD-ROM by calling the information and technical assistance toll-free number at 1-888-42ATSDR (1-888-422-8737), by email at [atsdric@cdc.gov](mailto:atsdric@cdc.gov), or by writing to:

Agency for Toxic Substances and Disease Registry  
Division of Toxicology and Environmental  
Medicine  
1600 Clifton Road NE  
Mailstop F-32  
Atlanta, GA 30333  
Fax: 1-770-488-4178

For-profit organizations may request a copy of final profiles from the following:

National Technical Information Service (NTIS)  
5285 Port Royal Road  
Springfield, VA 22161  
Phone: 1-800-553-6847 or 1-703-605-6000

Web site: <http://www.ntis.gov/>

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